REMARKS/ARGUMENTS

Initially, the Applicants have amended the specification to provide appropriate headings as requested by the Examiner. Entry of these headings into the specification is earnestly solicited and respectfully requested.

The Examiner has further indicated that the Oath or Declaration is defective because, allegedly, there is no indication on the oath or declaration whether priority is claimed or not claimed to the foreign priority reference as indicated in the oath or declaration. The Applicants respectfully disagree. The Declaration does not place an "X" under the YES or NO of the Priority Claimed section of the Declaration. However, marking YES or NO at this section is superfluous because the Declaration clearly states in the last sentence just before that section "and we have also identified below any foreign application for patent or inventor's certificate, or any PCT international application, having a filing date before that of the application on which ***priority is claimed.***" Thus, there is a clear indication ***in the Declaration*** that priority is claimed to the foreign priority reference indicated in the Declaration.

To the extent the Examiner still disagrees with the Applicants concerning the allegedly defective Declaration, the undersigned attorney would appreciate the Examiner's confirmation that, in the alternative to a new Oath or Declaration, an Application Data Sheet under 37 CFR 1.76 can be provided to overcome the defect in the Declaration. A telephone call to the undersigned or comment in any further Office Action or Notice of Allowance to this affect would be appreciated.

Next, turning to claim objections set forth at pages 2 and 3 (paragraph 4) of the Office Action and the rejection of claims 7-10, 13-14 and 17 under 35 U.S.C. 112, second paragraph as set forth in paragraph 6 of the Office Action, the Applicants first note a definition of the pivot beams has been added to claim 1. Further amendments to claim 1 address the fact the mass is constrained to perform only rotational movements about a pivotal axis defined by the pivot beams. In claim 5, the claim has been amended at line 3 to include the phrase "at least one relatively long sensing" before the word "beam." In claim 7, the phrase "the general shape" has been amended to "a general shape" and the phrase "the sensing beams extend" have been modified to "the at least one sensing beam extends." In claim 8, at line 2, the word "pivot" has been added before the word "beam." The amendment to claim 12 adds definition of the two

openings and the two masses. The amendment to claim 13 modifies the phrase "the sensing beams of the two masses" to "the at least one sensing beam of a first and a second mass." Each of these amendments does not add new matter and, therefore, entry of this amendment is respectfully requested.

With respect to the Examiner's assertion that claim 19 appears to be a duplicate claim of claim 4, the Applicants again respectfully disagree. Claim 4 discloses that the at least one sensing beam *is of a piezo-electric material*; that is to say that the sensing beam is made solely from piezo-electric material. In contrast, claim 19 discloses that at least one sensing beam *carries piezo-electric material*. Claim 19 therefore defines that the sensing beam is made from a **non-piezo-electric material** but bears piezo-electric material thereon.

Turning to the prior art rejections, it is noted that claims 1-11 have been rejected under 35 U.S.C. 102(b) as being anticipated by Kunz et al. Kunz discloses a tri-axial single mass accelerometer which uses a piezoelectric detection technique. The device enables acceleration to be detected in any direction by virtue of the symmetrical layout of the beams. The direction of acceleration can then be resolved using appropriate mathematical analysis on the outputs obtained from the beams.

There is a fundamental difference between the product of Kunz and that of the present invention. The product of Kunz discloses an accelerometer with four equally sized beams, all of which flex along their lengths when the mass is subjected to acceleration. The mass, therefore, is free to move in any direction, thereby allowing detection of acceleration in any direction.

By contrast, the product of the present invention discloses an accelerometer with two relatively short pivot beams which are incapable of flexing and at least one relatively long sensing beam which has the ability to flex only along its length. The mass is constrained to perform only rotational movement around an axis defined by the length of the relatively short beams, and acceleration can be determined only in one direction normal to the pivot access; the accelerometer is therefore a single-axis device. In order to sense acceleration in three directions, three accelerometers are required.

The Kunz document falls into the prior art category described in the opening part of the specification, where it is explained that in order to provide accurate readings, the sensitivities in each direction need to be equal. Typically, the out-of-plane response,

in the type of accelerometer described in the Kunz document, is significantly larger than the in-plane response. This is because isolation of the individual signals is limited by the accuracy of manufacture, the symmetrical layout being vital to the accuracy. The requirement for equal signals in each direction also leads to cross-axis signals and as such the performance of the device is compromised. Furthermore, in order to determine the acceleration, the deformation of the support beams has to be analysed. As the deformation produced is complex, this process is rather intricate. The present invention addresses these drawbacks by providing multiple single axis accelerometers, produced from a single wafer. The advantage of having multiple single axis accelerometers is that each accelerometer has the ability to sense acceleration in only one direction whereby, as the mass is constrained to perform only rotational movements about one axis, the response in the out-of-plane direction is greatly minimised and this, therefore, leads to only very small cross-axis errors. The analysis required to determine the acceleration is also therefore less complex. To put the matter of anticipation beyond doubt, claim 1 has been revised to make it clear that the pivot beams define an axis about which the mass is constrained to perform only rotational movements.

The amendments to claim 1 serve clearly to distinguish the claimed subject matter from the disclosures of Kunz et al. As the latter document is concerned solely with a single-mass tri-axial accelerometer with four equally sized beams which can all flex along their length and width and the claimed subject matter excludes such a configuration, there can be no anticipation by Kunz et al.

Claims 2 to 11 are all dependent either directly or indirectly on claim 1. Since it has been demonstrated above that claim 1 as amended is not anticipated by Kunz et al, no further comment is required on these subsidiary claims, all of which are believed to be allowable as amended or as originally or previously set forth.

It is also noted that claims 1-19 have been rejected under 35 U.S.C. 102(b) as being anticipated by Takeuchi et al (EP0869366). Takeuchi discloses a sensor unit having multiple sensors wherein each of the multiple sensors provides independent detection of a force component along one of the x, y and z-axes – *i.e.*, each sensor is a single-axis device.

Typical multiple single axis MEMS devices that are produced in a single wafer give unequal responses in the out-of-plane direction as compared to the in-plane

direction. The Takeuchi application attempts to improve the typical device by positioning one of the masses so that its centre of gravity is located in the same plane as the frame of the wafer.

While Takeuchi discloses a multitude of different embodiments, all of these define flexible plates (column 3, line 12) that extend across a hollow and suspend the mass thereon; all of the flexible plates are simultaneously deformed in response to the behaviour of the operating member consequent upon being subjected to acceleration (column 3, line 17 – line 19). Takeuchi does not disclose or suggest an embodiment where the mass is constrained to perform only rotational movements, by a pair of co-axial, relatively short pivot beams together defining a pivotal axis for the mass.

By contrast, the invention of the present case attempts to overcome the problems associated with the prior art by providing co-axial pivot beams to connect the mass to the wafer. In the present invention, the pivot beams are a crucial feature. The pivot beams define an axis and allow the mass to be constrained to perform only rotational movements about that axis. This feature enables the out-of-plane response to be significantly minimised and therefore reduces the cross-axis errors.

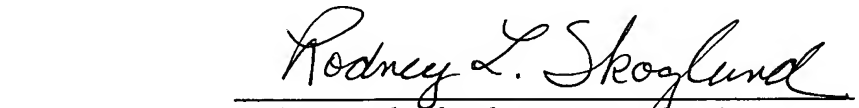
As such, it is submitted that the teachings of Takeuchi et al are not relevant to this application since Takeuchi is concerned with accelerometers having a sensing mass connected to the frame by flexible plates, and the mass is constrained solely by the plates and so can perform complex non-pivotal motion.

As the amendments now offered to claim 1 add a definition of the pivot beams and emphasise that the mass is constrained to perform only rotational movements, the claimed subject matter is now clearly distinguished from the disclosures of Takeuchi et al. As such there can be no anticipation by Takeuchi et al.

In light of the foregoing amendments and arguments presented herein, the Applicants respectfully request the Examiner to reconsider the application and to withdraw her objections to the specification and claims and her rejections of the claims. A Notice of Allowance of claims 1-19 is earnestly solicited. Should the Examiner care to discuss any of the foregoing in greater detail, the undersigned attorney would welcome a telephone call.

No additional claims fees are believed due, but a two-month extension of time has been requested. The associated fee for the extension of time accompanies this Amendment. Nonetheless, in the event that a fee required for the filing of this document is missing or insufficient, the undersigned attorney hereby authorizes the Commissioner to charge payment of any fees associated with this communication or to credit any overpayment to Deposit Account No. 18-0987.

Respectfully submitted,



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